MESHFREE PROTOTYPE SYSTEM WITH GUI FOR STRUCTURAL ANALYSIS SYSTEM USING EFGM

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The Finite Element Method (FEM) is used for a lot of CAE (Computer Aided Engineering) systems. The connectivity information between nodes and elements is nesseary for the FEM analysis. Although the pre and post processors for the FEM system have been developed, we have still consumed time of the engineers for creating FEM mesh and for remeshing. Furthermore, it is difficult to generate models of analyses for except experienced engineers.

The element-free Galerkin method (EFGM) is one of the meshless methods. This method is a new numerical method which is expected to be utilized for many problems of the continuum mechanics and for a main tool of the seamless system between the CAD and the CAE instead of the finite element method. The EFGM is desired as the CAE system reducing time and costs of the designing structures. The EFGM is studied by a lot of researchers. It is tried to be applied to geometrically nonlinear and three dimensional crack propagated problem etc. We also applied the EFGM to creep, elastic-plastic, dynamic and their fracture mechanics problem.

There is another feature of the EFGM which is the continuity of the first derivative i.e. strain and stress for a structural analysis by selecting the weight function. Then we can obtain displacement, strain and stress anywhere. Calculating the fracture mechanics parameter, we can calculate more accurate fracture mechanics parameter for nonlinear fracture mechanics problems.

Therefore, we developed a 2-D integrated meshfree analysis system with the GUI (Graphic User Interface) system that the fracture mechanics parameters can be calculated. The EFGM is applied to a system of material nonlinear and dynamic analyses. The elastic-plastic mechanics parameters J and T* integral for nonlinear and the dynamic J integral for dynamic analysis can be calculated by the meshfree system. The pre-process and post-process window of this meshfree analysis system are shown in Fig. 1 and Fig. 2 respectively. In this meshless sytem, we can generate models for the EFGM calculation of the elastic-plastic and dynamic analysis by this meshfree system easily, analyze elastic-plastic problem, calculate fracture mechanics parameters and display all results of analysis graphically.

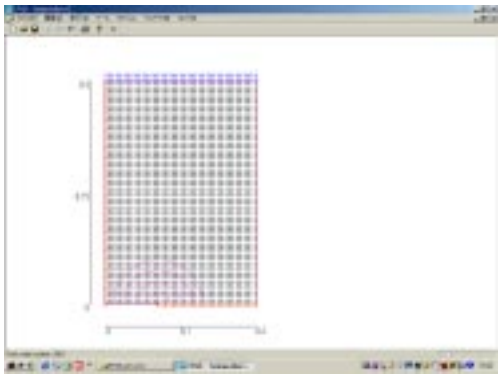

Fig. 1 Pre-process window of center-cracked plate for fracture mechanics problems.

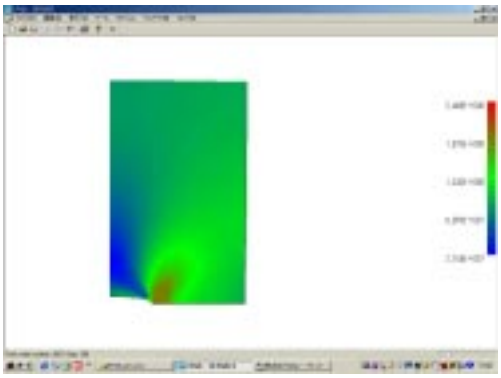

Fig. 2 Post-process window deformation and contour of von Mises stress.